Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 670-672
Received: 07-06-2020
Accepted: 10-08-2020

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Mizo chilli (*Capsicum frutescens)*: A potential source of capsaicin with broad-spectrum ethno pharmacological applications

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DOI: https://doi.org/10.22271/phyto.2020.v9.i5j.12306

Abstract
Capsaicinoids are the compounds responsible for the pungency of chilli and their products. Capsaicin is also considered as an active principle which accounts for the pharmaceutical properties of peppers. It has been used as an analgesic against arthritis pain and inflammation. It has also been reported to show anticancer effect and to be active against neurogenic inflammation. For this reason, capsaicin content of three varieties of Mizoram Bird's Eye chilli (MZBEC) (*Capsicum frutescens*) was determined by spectrophotometry. The results shown that Grade- A variety possesses the highest content in capsaicin (607.9mg/100g of dry weight followed by Grade-B and Grade C). The 'Mizo chilli' a chilli variety indigenous to Mizoram in the northeast region of India has been used conventionally in treating various ailments since time immemorial by the indigenous people. The present paper reviews that rich amount of capsaicin are present in Mizo chilli which has high ethnopharmacological value.

Keywords: Capsaicinoid, capsaicin, spectrophotometry, mizoram birds' eye chilli, *Capsicum frutescens*

Introduction
The extremely hot or burning sensation of chilli is due to the presence of capsaicinoids found only in *Capsicum* (Hoffman *et al*., 1983) [1]. The capsaicinoids present in the *Capsicum* fruit are predominantly capsaicin and dihydrocapsaicin making up 80 to 90%.The ratio of capsaicin to dihydrocapsaicin ranges between 1:1and 2:1 (Govindarajan and Sathyanarayana, 1991) [3]. The capsaicin content of fruits of *Capsicum frutescens* has been found to be very high in comparison to the fruits of the other chilli species (Sanatombi and Sharma, 2008) [2]. The pharmaceutical applications of capsaicinoids are attributed to their analgesic, antiarthritic, anticancer, and antioxidant properties (Prasad *et al*., 2005) [4]. In fact, capsaicin has been at the center of intense research for elucidating the basis of its pharmacological properties and exploiting the therapeutic potential (reviewed by Prasad *et al*., 2005) [4]. Capsaicin has become a promising molecule for the development of a new generation of analgesic-anti-inflammatory agents targeting the nociceptive primary afferent neurons (Szolcsanyi, 2003) [5]. It has also been reported to inhibit the growth of prostate cancer cells (Mori *et al*., 2006). The antioxidative capacity of chillies are higher than ginger, garlic, mint and onion (Shobana and Naidu, 2000) [6], which may play an important role in the process of chemo prevention (Yu *et al*., 2002) [7].The genus *Capsicum* (Solanaceae) consists of five domesticated species: *Capsicum annuum* L., *Capsicum baccatum* L., *Capsicum chinense* Jacq., *Capsicum frutescens* L. and *Capsicum pubescens* Ruiz & Pav as well as around 25 wild species (IBPGR, 1983) [8]. *Capsicum annuum* is one of the major vegetable and spice crops cultivated worldwide. Dietary spices are important ingredients commonly prescribed in Indian systems of medicine including Ayurveda, Siddha and Unani systems (Pruthi, 1976; Kochhar, 1996) [9, 10] and during the past years have received renewed attention for treating chronic and acute diseases. One of such dietary spice is the fruit of *Capsicum frutescens* a source of the highly pungent capsaicinoids and of antioxidants, which may play a role in preventing or reducing chronic and age-related diseases. The 'Mizo chilli', which is native to Mizoram in the northeastern part of India, has received the attention due to its high pungency and unique aroma. It is known by various names in Mizoram such as Mizoram Birds 'eye chilli (MZBEC) or 'Hmarchate' or 'Vaihmarchate'. (Dutta SK *et al*., 2018) [12]. It has also been used conventionally by different ethnic communities of the northeastern India in treating various human ailments (Bhagowati and Changkija, 2009) [11]. Besides being used as spice and vegetable, they are also used as a very good source of ethno-medicines for a number of diseases by the traditional healers.

However, systematic and more extensive ethnomedicinal investigations are not carried out to provide new insights into the other traditional uses of this important plant. In-depth research endeavors should also be directed towards phytochemical and pharmacological investigations of Mizo chilli that could lead to unearthing new bioactive compounds/activities. The objective of this study was to determine capsaicin content of these high yielding chilli varieties to better guide farmers, consumers and pharmaceutical industries.

Material and Methods

Plant material: Three varieties of fresh red Mizo bird's eye chilli (*Capsicum frutescens*) as Grade- A, B and C were used as the materials in this study (Figure 1.). The samples were collected from Horticulture Centre of Excellence, Thiak village, about 45 kilometres south of Aizawl, Mizoram. The samples were put into polyethylene bags and immediately transported to the laboratory and then stored at –18◦C until extraction for analysis.

Extraction and determination of capsaicin content: Capsaicin content in the samples was estimated by spectrophotometric measurement of the blue coloured component formed as a result of reduction of phosphomolybdic acid to lower acids of molybdenum following Ademoyegun *et al*. (2011) [14]. One gram (1g) of each dry sample was extracted with 10 ml of dry acetone using pestle and mortar. The extract was centrifuged at 10,000 rpm for 10 min and 1ml of supernatant was pipetted into a test tube and evaporated to dryness in a hot water bath (60°C). The residue was then dissolved in 0.4 ml of NaOH solution and 3 ml of 3% phosphomolybdic acid. The contents were shaken and allowed to stand for 1 h. The solution was filtered to remove any floating debris and centrifuged at 5,000 rpm for 15 min. Absorbance was measured for the clear blue solution, thus obtained, at 650 nm using reagent blank (5 ml of 0.4% NaOH+ 3ml of 3% phosphomolybdic acid). Capsaicin content is calculated from the standard curve and expressed as mg/ 100g on dry basis.

Fig 1: Three Grades of Mizo Chilli (*Capsicum frutescens)*

Results

Capsaicin content

The standardization curve equation gotten is: Y = 0.002X + 0.016 (Figure 2). It was used to calculate the content of the capsaicin (expressed in mg/100g of dry weight) contained in each sample of chilli pepper analysed (Figure 2). The content varied from a variety to another. The highest capsaicin content was 607.9 mg/100g of dry weight in Grade-A followed by 585.5 mg/100g in Grade-B while the lowest was 567.4 mg/100g of dry weight in Grade-C (Table1).

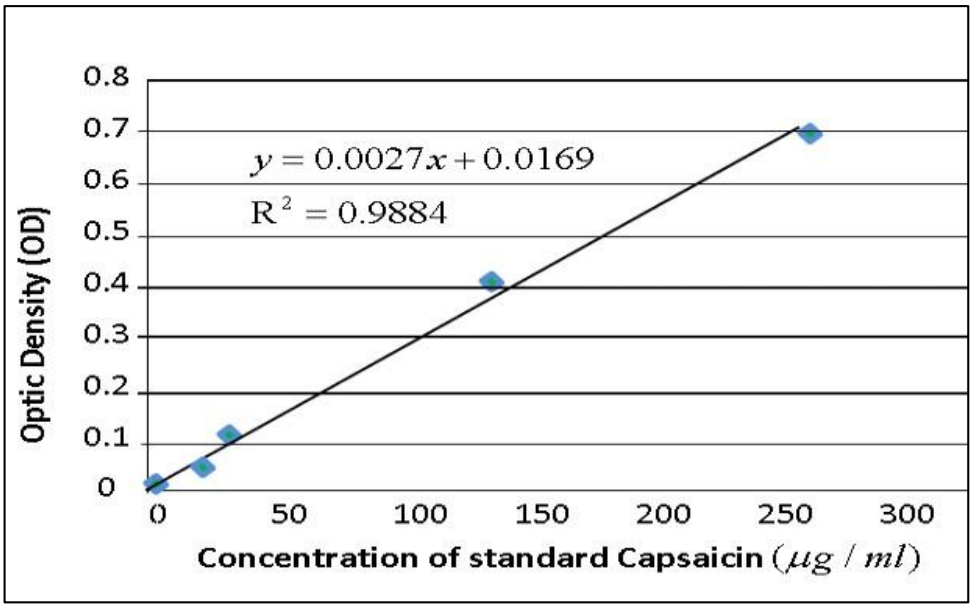

Fig 2: Standard calibration curve of Capsaicin

Table 1: Amount of Capsaicin found in the selected verities of Chilli samples

Sl. No	Name of Mizoram bird's eye chilli(MZBEC) varieties	Capsaicin Content in Dry weight (mg/100g)
1	MZBEC Grade- A	607.9
2	MZBEC Grade- B	585.5
3	MZBEC Grade- C	567.4

Discussion

The results show that all the three varieties of Mizoram bird's eye chilli (MZBEC) content rich amount of capsaicin. The capsaicin contents vary from a chilli pepper variety to another and don't depend on any morphological similarity (A. Orobiyi *et al*., 2015) [15]. The inverse relationship between size and pungency confirms report by Derek and Wibberley that peppers are hotter if they are smaller. These varieties can be

exploited by pharmaceutical industries in the manufacturing of some remedies against cancer, diabetes, and cardiovascular illnesses. It is therefore necessary to follow up on the analyses within the whole existing diversity in order to find the landraces that are naturally rich in capsaicin. Moreover other programs must be put in place in order to find within the whole existing diversity or to create some very productive and rich landraces of chilli pepper in capsaicin and that will be very valuable in pharmacology.

Acknowledgement
We sincerely acknowledge the staffs of Horticulture Centre of Excellence, Thiak, Department of Horticulture, Mizoram for their kind help and cooperation extended during the survey work. Authors are thankful to the department of Botany, Mizoram University for providing laboratories and materials to conduct research.

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